Attachment A
WQMP Template

SAN BERNARDINO COUNTY STORMWATER PROGRAM

WATER QUALITY MANAGEMENT PLAN TEMPLATE

WATER QUALITY MANAGEMENT PLAN (WQMP)

For compliance with Santa Ana Regional Water Quality Control Board

Order Number R8-2002-0012 (NPDES Permit No. CAS618036)

for

Project Name

Prepared for:
Name of Owner
Address for Project Location
City, State, Zip for Project Location

WQMP Preparation Date
Date

WATER QUALITY MANAGEMENT PLAN (WQMP)

PROJECT SITE INFORMATION

Name of Project: _____

Project Location: _____

Size of Significant Re-Development on an Already Developed Site (in feet^2): _____

Size of New Development (in feet^2): _____

Number of Home Subdivisions: _____

SIC Codes: _____

Erosive Soil Conditions?: _____

Natural Slope More Than 25%?: _____

Indicate type of project by placing an "X" by one of the following:

_____ [Industrial/Commercial]

_____ [Automotive Repair Shop]

_____ [Restaurant]

_____ [Hillside Development]

_____ [Parking Lot]

_____ [Development that discharges to an environmentally sensitive area, area of special biological significance, or 303(d) listed of impaired waterbody]

WATER QUALITY MANAGEMENT PLAN (WQMP)

Check the appropriate project category below:

Check below	***Project Categories***
	1. All significant re-development projects. Significant re-development is defined as the addition or creation of 5,000 or more square feet of impervious surface on an already developed site. This includes, but is not limited to, additional buildings and/or structures, extension of existing footprint of a building, construction of parking lots, etc. Where redevelopment results in an increase of less than fifty percent of the impervious surfaces of a previously existing development, and the existing development was not subject to SUSMPs, the design standards apply only to the addition, and not the entire development. When the redevelopment results in an increase of more than fifty percent of the impervious surfaces, then a WQMP is required for the entire development (new and existing).
	2. Home subdivisions of 10 units or more. This includes single family residences, multi-family residence, condominiums, apartments, etc.
	3. Industrial/commercial developments of 100,000 square feet or more. Commercial developments include non-residential developments such as hospitals, educational institutions, recreational facilities, mini-malls, hotels, office buildings, warehouses, and light industrial facilities.
	4. Automotive repair shops (with SIC codes 5013, 5014, 5541, 7532- 7534, 7536-7539).
	5. Restaurants where the land area of development is 5,000 square feet or more.
	6. Hillside developments of 10,000 square feet or more which are located on areas with known erosive soil conditions or where the natural slope is twenty-five percent or more.
	7. Developments of 2,500 square feet of impervious surface or more adjacent to (within 200 feet) or discharging directly into environmentally sensitive areas such as areas designated in the Ocean Plan as areas of special biological significance or waterbodies listed on the CWA Section 303(d) list of impaired waters.
	8. Parking lots of 5,000 square feet or more exposed to storm water. Parking lot is defined as land area or facility for the temporary storage of motor vehicles.
	9. The project is a discretionary action and has a precise plan of development or subdivision of land.
	The project does not fall into any of the categories described above.

SECTION 1
INTRODUCTION AND PROJECT DESCRIPTION

1.1 PROJECT INFORMATION

- Name of project owner.
- Address of project owner.
- Telephone for project owner.
- Project site address.

1.2 PERMITS

- List all permit number(s), condition number(s), and any acquired waste discharge identification numbers (WDIDs) pertaining to project.

1.3 PROJECT DESCRIPTION

- Provide a detailed project description include following:

  - Land-use type (refer to Tables 1-1 and 2-1 in the WQMP Guidance).

  - Project size.

  - Homeowners association or property owner association formation.

- Include location map and site plan identifying storm drain facilities and structures, structural BMPs, stormwater flow (drainage), and the receiving water. The location and site plan may be shown on the same map.

1.4 SITE DESCRIPTION

- Describe and identify the watershed(s) that the project lies within.
- Include any pre-existing water quality problems that have been identified.

SECTION 2
POLLUTANT AND HYDROLOGIC CONDITION CONCERNS

2.1 POLLUTANTS OF CONCERN (Not required for Non-Category projects)

List all expected pollutants of concern for the project site. Use Table 2-1 in the WQMP Guidance to identify the potential pollutants expected to be generated by the development. Use Table B-1 in the WQMP Guidance to identify any pollutants that contribute to waterbody impairments on the 303(d) list. List any other pollutants of concern from the project site not listed in Tables 2-1 and B-1

2.2 HYDROLOGIC CONDITIONS OF CONCERN (Not required for Non-Category projects)

Determine if the project will create a Hydrologic Condition of Concern. From Section 2.3, part 2, check yes or no as applicable and provide explanation in the box below each section. Attach any additional sheets.

Section 2.3, Part 2.	**YES**	**NO**
A		
B		
C		

Will the project create a HCOC ?

If yes, then go to Section 2.3, Part 3, below.
If no, then go to Section 3.

Section 2.3, Part 3:	**YES**	**NO**
A		
B		
C		
D		
E		
F		

Is the report required by 2.3, Part 3.f complete? (Attach the report)

Does the report determine that the project will have an adverse downstream impact?
If yes, then go to Section 2.3, Part 4, below.
If no, then go to Section 3.

Section 2.3, Part 4:	**YES**	**NO**
A		
B		
C		

Are the requirements for Section 2.3 Part 4 adequate? (Attach results)

Has the project proponent recommended BMPs to mitigate any impacts based on the modeling?
If yes, then list/describe BMPs:

If no, then explain how mitigation will be achieved:

Will the BMPs be effective?

Does the Agency have any additional requirements?

SECTION 3
BEST MANAGEMENT PRACTICE SELECTION PROCESS

1.1 SITE DESIGN BMPS

Provide detailed descriptions of planned Site Design BMPs, if applicable.

1. Minimize Stormwater Runoff, Minimize Project's Impervious Footprint, and Conserve Natural Areas		
Maximize the permeable area. This can be achieved in various ways, including but not limited to, increasing building density (number of stories above or below ground) and developing land use regulations seeking to limit impervious surfaces.		
Yes	No	
Describe actions taken:		
Runoff from developed areas may be reduced by using alternative materials or surfaces with a lower Coefficient of Runoff, or "C-Factor".		
Yes	No	
Describe actions taken:		
Conserve natural areas. This can be achieved by concentrating or clustering development on the least environmentally sensitive portions of a site while leaving the remaining land in a natural, undisturbed condition.		
Yes	No	
Describe actions taken:		
Construct walkways, trails, patios, overflow parking lots, alleys, driveways, low-traffic streets, and other low-traffic areas with open-jointed paving materials or permeable surfaces, such as pervious concrete, porous asphalt, unit pavers, and granular materials.		
Yes	No	

Describe actions taken:		
Construct streets, sidewalks, and parking lot aisles to the minimum widths necessary, provided that public safety and a pedestrian friendly environment are not compromised[1]. Incorporate landscaped buffer areas between sidewalks and streets.		
Yes	No	
Describe actions taken:		
Reduce widths of street where off-street parking is available[2].		
Yes	No	
Describe actions taken:		
Maximize canopy interception and water conservation by preserving existing native trees and shrubs, and planting additional native or drought tolerant trees and large shrubs.		
Yes	No	
Describe actions taken:		
Minimize the use of impervious surfaces, such as decorative concrete, in the landscape design.		
Yes	No	

[1] Sidewalk widths must still comply with Americans with Disabilities Act regulations and other life safety requirements.

[2] However, street widths must still comply with life safety requirements for fire and emergency vehicle access.

Describe actions taken:		
Use natural drainage systems.		
Yes	No	
Describe actions taken:		
Where soils conditions are suitable, use perforated pipe or gravel filtration pits for low flow infiltration[3].		
Yes	No	
Describe actions taken:		
Construct onsite ponding areas, rain gardens, or retention facilities to increase opportunities for infiltration, while being cognizant of the need to prevent the development of vector breeding areas.		
Yes	No	
Describe actions taken:		
Other comparable site design options that are equally effective.		
Yes	No	
Describe actions taken:		

[3]However, projects must still comply with hillside grading ordinances that limit or restrict infiltration of runoff. Infiltration areas may be subject to regulation as Class V injection wells and may require a report to the USEPA. Consult the Agency for more information on use of this type of facility.

2. Minimize Directly Connected Impervious Areas

Where landscaping is proposed, drain rooftops into adjacent landscaping prior to discharging to the storm drain.

Yes	No	

Describe actions taken:

Where landscaping is proposed, drain impervious sidewalks, walkways, trails, and patios into adjacent landscaping.

Yes	No	

Describe actions taken:

Increase the use of vegetated drainage swales in lieu of underground piping or imperviously lined swales.

Yes	No	

Describe actions taken:

Use one or more of the following:

Yes	No	Design Feature
		Rural swale system: street sheet flows to vegetated swale or gravel shoulder, curbs at street corners, culverts under driveways and street crossings
		Urban curb/swale system; street slopes to curb; periodic swale inlets drain to vegetated swale/biofilter.
		Dual drainage system: First flush captured in street catch basins and discharged to adjacent vegetated swale or gravel shoulder, high flows connect directly to municipal storm drain systems.
		Other comparable design concepts that are equally effective.

Describe actions taken:

Use one or more of the following features for design of driveways and private residential parking areas:

Yes	No	Design Feature
		▪ Design driveways with shared access, flared (single lane at street) or wheel strips (paving only under tires); or, drain into landscaping prior to discharging to the municipal storm drain system.
		▪ Uncovered temporary or guest parking on private residential lots may be paved with a permeable surface; or designed to drain into landscaping prior to discharging to the municipal storm drain system.
		▪ Other comparable design concepts that are equally effective.

Describe actions taken:

Use one or more of the following design concepts for the design of parking areas:

Yes	No	Design Feature
▪	▪	▪ Where landscaping is proposed in parking areas, incorporate landscape areas into the drainage design.
▪	▪	▪ Overflow parking (parking stalls provided in excess of the Agency's minimum parking requirements) may be constructed with permeable paving.

▪	▪	▪ Other comparable design concepts that are equally effective.
Describe actions taken:		

1.2 SOURCE CONTROL BMPS

- Complete the following selection table for Source Control BMPs, by checking boxes that are applicable. All listed BMPs shall be implemented for the project. Where a required Source Control BMP is infeasible, justification and/or alternative practices for preventing pollutants must be provided. Provide detailed descriptions on the implementation of planned Source Controls.

Source Control BMP Selection Matrix

Project Category	Source Control BMPs																								
	Education of Property Owners	*Activity Restrictions*	*Spill Contingency Plan*	*Employee Training/Education Program*	*Street Sweeping Private Street and Parking Lots*	*Common Areas Catch Basin Inspection*	*Landscape Planning (SD-10)*	*Hillside Landscaping*	*Roof Runoff Controls (SD-11)*	*Efficient Irrigation (SD-12)*	*Protect Slopes and Channels*	*Storm Drain Signage (SD-13)*	*Inlet Trash Racks*	*Energy Dissipators*	*Trash Storage Areas (SD-32) and Litter Control*	*Fueling Areas (SD-30)*	*Air/Water Supply Area Drainage*	*Maintenance Bays and Docks (SD-31)*	*Vehicle Washing Areas (SD-33)*	*Outdoor Material Storage Areas (SD-34)*	*Outdoor Work Areas (SD-35)*	*Outdoor Processing Areas (SD-36)*	*Wash Water Controls for Food Preparation Areas*	*Pervious Pavement (SD-20)*	*Alternative Building Materials (SD-21)*
Significant Re-development																									
Home subdivisions of 10 or more units																									
Commercial/ Industrial Development >100,000 ft^2																									
Automotive Repair Shop																									
Restaurants																									
Hillside Development >10,000 ft^2																									
Development of impervious surface >2,500 ft^2																									
Parking Lots >5,000 ft^2 of exposed storm water																									

3.3 TREATMENT CONTROL BMPS (NOT REQUIRED FOR NON-CATEGORY PROJECTS)

- Complete the following selection table for Treatment Control BMPs. Check the boxes applicable to the project site. Treatment control BMPs must be selected and installed with respect to identified pollutant characteristics and concentrations that will be discharged from the site. It is the responsibility of the project developer to demonstrate, and document, that all stormwater will receive adequate treatment before it is discharged from the site. The Agency may require information beyond the minimum requirements of this WQMP to demonstrate that adequate pollutant treatment is being accomplished.

- Provide detailed descriptions on the location, implementation, installation, and long-term O&M of planned Treatment Control BMPs.

Treatment Control BMP Selection Matrix

Priority Project Category	Treatment Control BMPs													
	Infiltration Trench	Infiltration Basin	Retention/Irrigation	Wet Pond	Constructed Wetland	Extended Detention Basin	Vegetated Swale	Vegetated Buffer Strip	Bioretention	Media Filter	Water Quality Inlet	Multiple Systems	Hydrodynamic devices	Manufactured/Proprietary
Significant Re-development														
Home subdivisions of 10 or more units														
Commercial/ Industrial Development >100,000 ft^2														
Automotive Repair Shop														
Restaurants														
Hillside Development >10,000 ft^2														
Development of impervious surface >2,500 ft^2														
Parking Lots >5,000 ft^2 of exposed storm water														

3.4 BMP DESIGN CRITERIA

- The following Treatment Control BMP(s) (Flow Based or Volume Based) will be implemented for this project (***check "Implemented" box, if used***):

Design Basis of Treatment Control BMPs

Implemented	Treatment Control BMP	Design Basis
	Vegetated Buffer Strips	Flow Based
	Vegetated Swale	
	Multiple Systems	
	Manufactured/Proprietary	
	Bioretention	Volume Based
	Wet Pond	
	Constructed Wetland	
	Extended Detention Basin	
	Water Quality Inlet	
	Retention/Irrigation	
	Infiltration Basin	
	Infiltration Trench	
	Media Filter	
	Manufactured/Proprietary	

3.4.1 FLOW BASED DESIGN CRITERIA

- Calculate the BMP design flow by using the approach presented in the WQMP Guidance (Section 2.5.2.1). Show calculations in detail.

3.4.2 VOLUME BASED DESIGN CRITERIA

- Calculate the required capture volume of the BMP using the approach presented in the WQMP Guidance (Section 2.5.2.2). Show calculations in detail.

SECTION 4
OPERATION AND MAINTENANCE

4.1 OPERATIONS AND MAINTENANCE

- Operation and maintenance (O&M) requirements for all Source Control, Site Design, and Treatment Control BMPs shall be identified within the WQMP. The WQMP shall include the following:

4.1.1 O&M DESCRIPTION AND SCHEDULE

- List and identify each BMP that requires O&M.
- Provide a thorough description of O&M activities (include the O&M process, and the handling and placement of any wastes).
- Include BMP start-up dates.
- Provide schedule of the frequency of O&M for each BMP.

4.1.2 INSPECTION & MONITORING

- Provide thorough descriptions of water quality monitoring (if locally required)
- Provide self-inspections and record keeping requirements for BMPs (review local specific requirements regarding self-inspections and/or annual reporting), including identification of responsible parties for inspection and record keeping.

4.1.3 IDENTIFICATION OF RESPONSIBLE PARTIES

- Provide the party or parties that will be responsible for each BMP O&M. For each responsible party, include the party's name, address, contact name and telephone number.

SECTION 5
FUNDING

5.1 FUNDING

- The Permit requires that for all Treatment Control BMPs, a funding source or sources for operation and maintenance of each BMP be identified within the WQMP.
- Indicate funding sources or sources for O&M for this project. For each funding source, include the responsible party's name, address, contact name and telephone number.

SECTION 6
WQMP CERTIFICATION

6.1 CERTIFICATION

- The applicant is required to sign and certify that the WQMP is in conformance with Santa Ana Regional Water Quality Control Board Order Number R8-2002-0012 (NPDES Permit No. CAS618036).

- The applicant is required to sign and date the following statement 'word-for-word' certifying that the provisions of the WQMP have been accepted by the applicant and that the applicant will have the plan carried out by future successors (transferability statement). The certification must be signed by the property owner, unless a written designation by the owner allows a designee to sign on the owner's behalf.

"This Water Quality Management Plan has been prepared for (Owner/Developer Name) by (Consulting /Engineering Firm Name). It is intended to comply with the requirements of the City of (name city or county) for Tract/Parcel Map No. _____, Condition Number(s) _____ requiring the preparation of a Water Quality Management Plan (WQMP). The undersigned is aware that Best Management Practices (BMPs) are enforceable pursuant to the City's/County's Water Quality Ordinance No. _____. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Stormwater Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity. "

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

_____ _____
Applicant's Signature Date

_____ _____
Applicant's Name Applicant's Telephone Number

Attachment A-1

Maintenance Mechanisms

A-1.1 The Agency shall not accept stormwater structural BMPs as meeting the WQMP requirements standard, unless an O&M Plan is prepared (see WQMP Section 2.6) and a mechanism is in place that will ensure ongoing long-term maintenance of all structural and non-structural BMPs. This mechanism can be provided by the Agency or by the project proponent. As part of project review, if a project proponent is required to include interim or permanent structural and non-structural BMPs in project plans, and if the Agency does not provide a mechanism for BMP maintenance, the Agency shall require that the applicant provide verification of maintenance requirements through such means as may be appropriate, at the discretion of the Agency, including, but not limited to covenants, legal agreements, maintenance agreements, conditional use permits and/or funding arrangements (OC 2003).

A-1.2 Maintenance Mechanisms

1. **Public entity maintenance**: The Agency may approve a public or acceptable quasi-public entity (e.g., the County Flood Control District, or annex to an existing assessment district, an existing utility district, a state or federal resource agency, or a conservation conservancy) to assume responsibility for operation, maintenance, repair and replacement of the BMP. Unless otherwise acceptable to individual Agencies, public entity maintenance agreements shall ensure estima ted costs are front-funded or reliably guaranteed, (e.g., through a trust fund, assessment district fees, bond, letter of credit or similar means). In addition, the Permittees may seek protection from liability by appropriate releases and indemnities.

The Agency shall have the authority to approve stormwater BMPs proposed for transfer to any other public entity within its jurisdiction before installation. The Permittee shall be involved in the negotiation of maintenance requirements with any other public entities accepting maintenance responsibilities within their respective jurisdictions; and in negotiations with the resource agencies responsible for issuing permits for the construction and/or maintenance of the facilities. The Agency must be identified as a third party beneficiary empowered to enforce any such maintenance agreement within their respective jurisdictions.

2. Project proponent agreement to maintain stormwater BMPs: The Agency may enter into a contract with the project proponent obliging the project proponent to maintain, repair and replace the stormwater BMP as necessary into perpetuity. Security or a funding mechanism with a "no sunset" clause may be required.

3. **Assessment districts:** The Agency may approve an Assessment District or other funding mechanism created by the project proponent to provide funds for stormwater BMP maintenance, repair and replacement on an ongoing basis. Any agreement with such a District shall be subject to the Public Entity Maintenance Provisions above.

4. **Lease provisions:** In those cases where the Agency holds title to the land in question, and the land is being leased to another party for private or public use, the Agency may assure stormwater BMP maintenance, repair and replacement through conditions in the lease.

5. **Conditional use permits:** For discretionary projects only, the Agency may assure maintenance of stormwater BMPs through the inclusion of maintenance conditions in the conditional use permit. Security may be required.

6. **Alternative mechanisms:** The Agency may accept alternative maintenance mechanisms if such mechanisms are as protective as those listed above.

Attachment B
Tables

Table B-1
303(d) List of Impaired Water Bodies

Waterbody	Pollutant					
	Bacteria Indicators/ Pathogens	Metals	Nutrients	Organic Enrichment	Sedimentation/Siltation	Suspended Solids
Big Bear Lake		X	X		X	
Canyon Lake (Railroad Canyon Reservoir)	X		X			
Chino Creek Reach 1	X		X			
Chino Creek Reach 2	X					
Cucamonga Creek, Valley Reach	X					
Grout Creek		X	X			
Knickerbocker Creek	X	X				
Lytle Creek	X					
Mill Creek (Prado Area)	X		X			X
Mill Creek Reach 1	X					
Mill Creek Reach 2	X					
Mountain Home Creek	X					
Mountain Home Creek, East Fork	X					
Prado Park Lake	X		X			
Rathbone (Rathbun Creek)			X		X	
Santa Ana River, Reach 3	X					
Santa Ana River, Reach 4	X					
Summit Creek			X			

NOTES:

1) Summary of the 2002 303(d) Listed Water Bodies and Associated Pollutants of Concern from RWQCB Region 8. Check for updated lists from the RWQCB.

2) Chlorides, pesticides, salinity, total dissolved solids (TDS), toxicity, and trash are listed impairments within the 303(d) table, however, they are not impairments in the above waterbodies.

Table B-2

Treatment Control BMP Selection Matrix [1]

	Targeted Constituents						
	Sediment	Nutrients	Trash	Metals	Bacteria	Oil and Grease	Organics
Vegetated Buffer Strip (TC-31)	H	L	M	H	L	H	M
Vegetated Swale (TC-30)	M	L	L	M	L	M	M
Multiple Systems (TC-60)	H	L	H	H	M	H	H
Bioretention (TC-32)	H	M	H	H	H	H	H
Wet Pond (TC-20)	H	M	H	H	H	H	H
Constructed Wetland (TC-21)	H	M	H	H	H	H	H
Extended Detention Basin (TC-22)	M	L	H	M	M	M	M
Water Quality Inlet (TC-50)	L	L	M	L	L	M	L
Retention/Irrigation (TC-12)	H	H	H	H	H	H	H
Infiltration Basin (TC-11)	H	H	H	H	H	H	H
Infiltration Trench (TC-10)	H	H	H	H	H	H	H
Media Filter (TC-40)	H	L	H	H	M	H	H

NOTES:

[1] This table is intended to provide general information on pollutant removal. More detailed information on pollutant removal can be obtained from the California Stormwater Quality Association's document, "California Best Management Practices Handbooks – New Development and Redevelopment" (CASQA, 2003). Refer to the web site for the most recent edition: www.cabmphandbooks.com.

L - Low removal effectiveness

M - Medium removal effectiveness

H - High removal effectiveness

Table B-3
C Values Based on Impervious/Pervious Area Ratios

% Impervious	% Pervious	C
0	100	0.15
5	95	0.19
10	90	0.23
15	85	0.26
20	80	0.30
25	75	0.34
30	70	0.38
35	65	0.41
40	60	0.45
45	55	0.49
50	50	0.53
55	45	0.56
60	40	0.60
65	35	0.64
70	30	0.68
75	25	0.71
80	20	0.75
85	15	0.79
90	10	0.83
95	5	0.86
100	0	0.90

NOTE:

Obtain individual runoff coefficient C-Factors from the local agency or from the local flood control district.

If C-Factors are not available locally, obtain factors from hydrology text books or estimate using this table.

Composite the individual C-Factors using area-weighted averages to calculate the Composite C Factor for the area draining to a treatment control BMP.

Do not use the C-Factors in this table for flood control design or related work.

Attachment C
Pollutants of Concern

Pollutants of Concern

- *Bacteria and Viruses* – Bacteria and Viruses are ubiquitous microorganisms that thrive under certain environmental conditions. Their proliferation is typically cause by the transport of animal or human fecal wastes from the watershed. Water, containing excessive bacteria and viruses, can alter the aquatic habitat and create a harmful environment for humans and aquatic life. Also, the decomposition of excess organic waste causes increased growth of undesirable organisms in the water.

- *Metals* – The primary source of metal pollution in stormwater is typically commercially available metals and metal products. Metals of concern include cadmium, chromium, copper, lead, mercury, and zinc. Lead and chromium have been used as corrosion inhibitors in primer coatings and cooling tower systems. Metals are also raw material components in non-metal products such as fuels, adhesives, paints, and other coatings. At low concentrations naturally occurring in soil, metals may not be toxic. However, at higher concentrations, certain metals can be toxic to aquatic life. Humans can be impacted from contaminated groundwater resources, and bioaccumulation of metals in fish and shellfish. Environmental concerns, regarding the potential for release of metals to the environment, have already led to restricted metal usage in certain applications (OC 2003).

- *Nutrients* – Nutrients are inorganic substances, such as nitrogen and phosphorus. Excessive discharge of nutrients to water bodies and streams causes eutrophication, where aquatic plants and algae growth can lead to excessive decay of organic matter in the water body, loss of oxygen in the water, release of toxins in sediment, and the eventual death of aquatic organisms. Primary sources of nutrients in urban runoff are fertilizers and eroded soils.

- *Pesticides* -- Pesticides (including herbicides) are chemical compounds commonly used to control nuisance growth or prevalence of organisms. Relatively low levels of the active component of pesticides can result in conditions of aquatic toxicity. Excessive or improper application of a pesticide may result in runoff containing toxic levels of its active ingredient (OC 2003).

- *Organic Compounds* – Organic compounds are carbon-based. Commercially available or naturally occurring organic compounds are found in pesticides, solvents, and hydrocarbons. Organic compounds can, at certain concentrations, indirectly or directly constitute a hazard to life or health. When rinsing off objects, toxic levels of solvents and cleaning compounds can be discharged to storm drains. Dirt, grease, and grime retained in the cleaning fluid or rinse water may also adsorb levels of organic compounds that are harmful or hazardous to aquatic life (OC 2003).

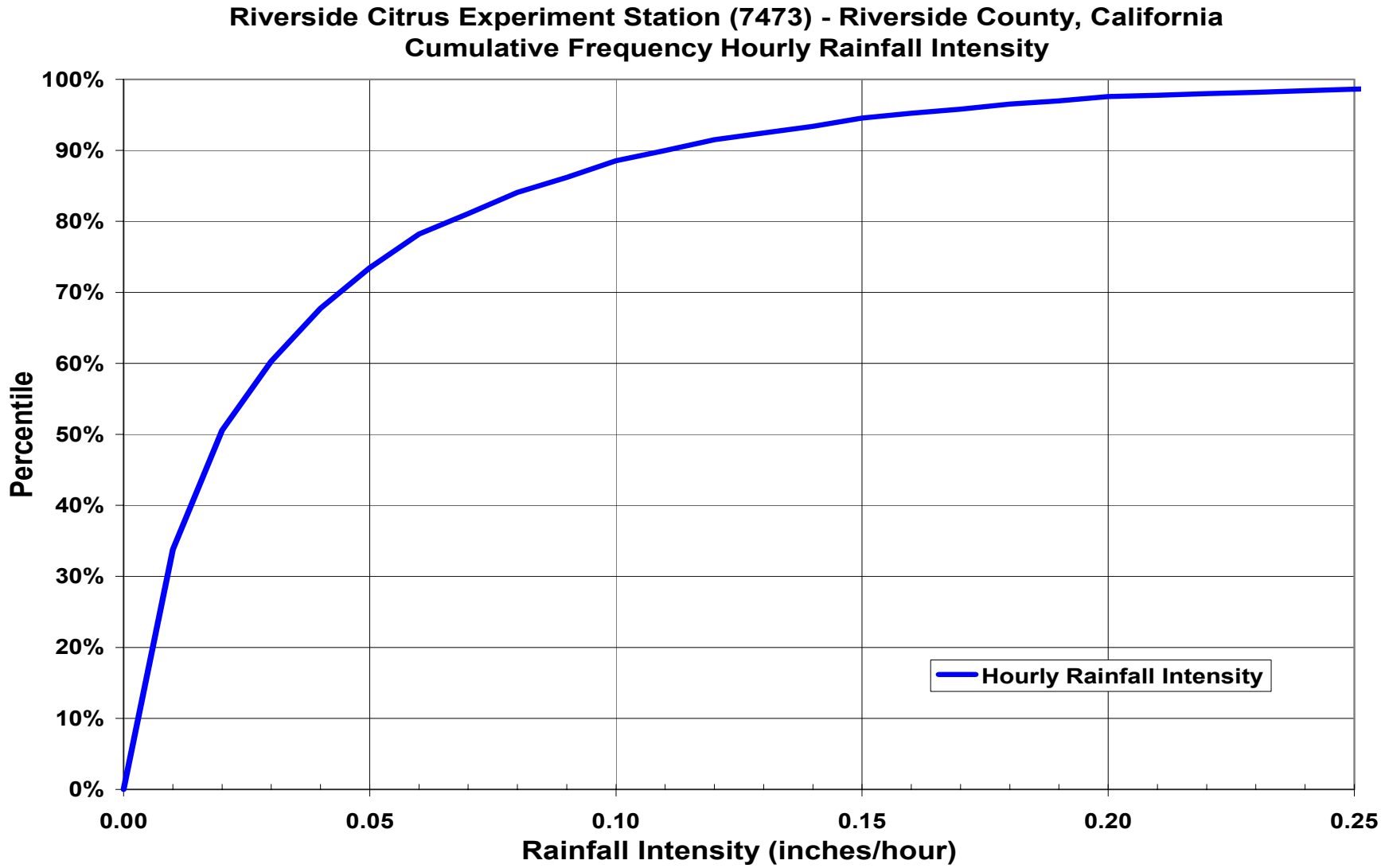
- *Sediments* – Sediments are solid materials that are eroded from the land surface. Sediments can increase turbidity, clog fish gills, reduce spawning habitat, lower young aquatic organisms survival rates, smother bottom dwelling organisms, and suppress aquatic vegetation growth.

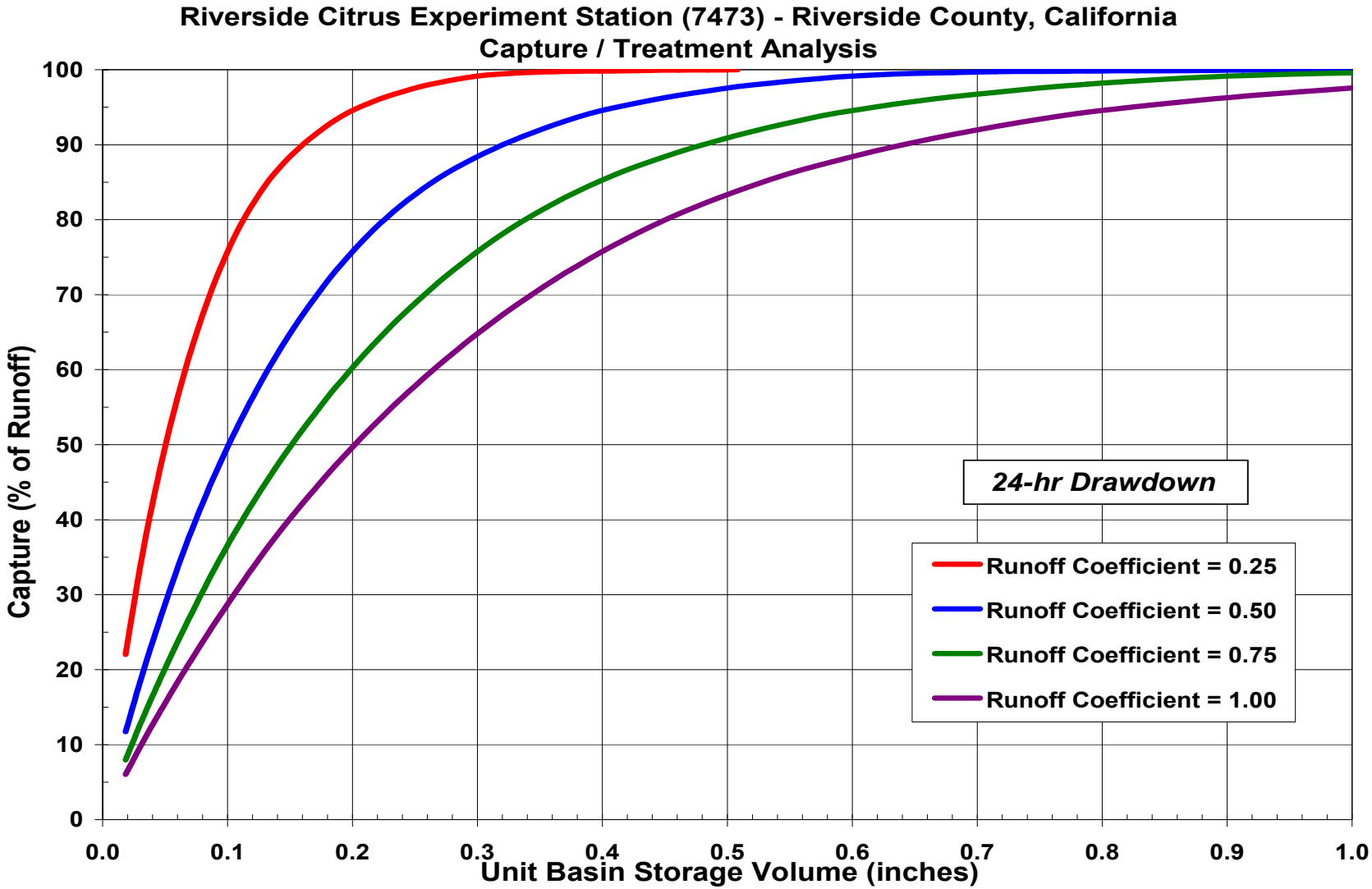
- *Trash and Debris* – Trash (such as paper, plastic, polystyrene packing foam, and aluminum materials) and biodegradable organic matter (such as leaves, grass cuttings, and food waste) are general waste products on the landscape. The presence of trash and debris may have a significant impact on the recreational value of a water body and aquatic habitat. Trash impacts water quality by increasing biochemical oxygen demand.

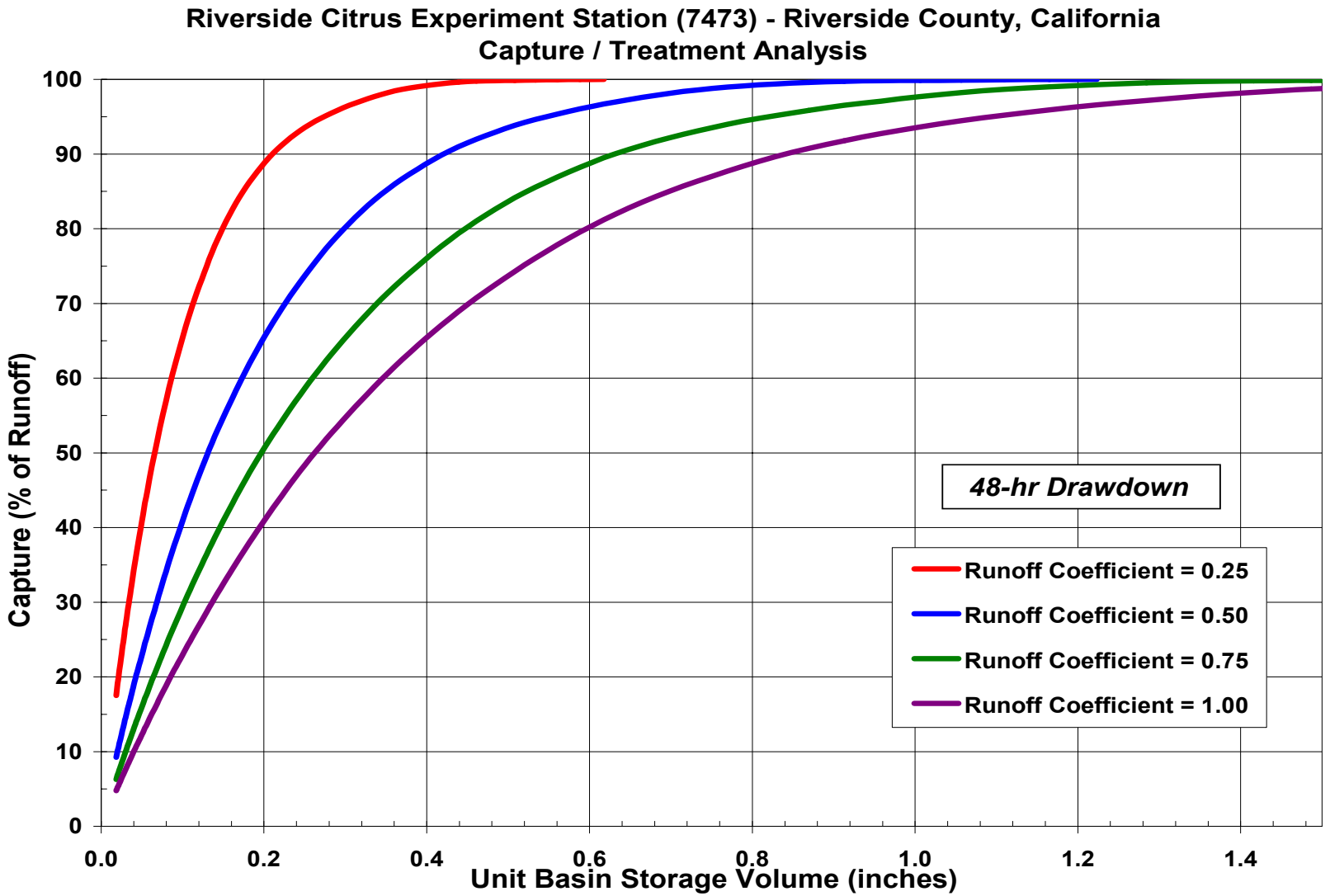
- *Oxygen-Demanding Substances* – This category includes biodegradable organic material as well as chemicals that react with dissolved oxygen in water to form other compounds. Proteins, carbohydrates, and fats are examples of biodegradable organic compounds. Compounds such as ammonia and hydrogen sulfide are examples of oxygen-demanding compounds. The oxygen demand of a substance can lead to depletion of dissolved oxygen in a water body and possibly the development of septic conditions. A reduction of dissolved oxygen is detrimental to aquatic life and can generate hazardous compounds such as hydrogen sulfides.
- *Oil and Grease* – Oil and grease in water bodies decreases the aesthetic value of the water body, as well as the water quality. Primary sources of oil and grease are petroleum hydrocarbon products, motor products from leaking vehicles, esters, oils, fats, waxes, and high molecular-weight fatty acids.

Attachment D
Rain Gauge Data Curves

Note: Rainfall runoff curves are under development for the San Bernardino County permit area, and will be incorporated into Attachment D by May 15, 2003. These curves will be substituted for the curves included herein as they become available. Until these curves become available, the curves herein may be utilized as generally representative of the area in accordance with the handbook, "*California Best Management Practices Handbook – Development and Redevelopment*" (CASQA, 2003).


Riverside Citrus Experiment Station (7473) - Riverside County, California
Cumulative Frequency Hourly Rainfall Intensity
Percentile
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.00
0.05
0.10
0.15
0.20
0.25
Rainfall Intensity (inches/hour)
Hourly Rainfall Intensity


Riverside Citrus Experiment Station (7473) - Riverside County, California
Capture / Treatment Analysis
Capture (% of Runoff)
100
90
80
70
60
50
40
30
20
10
0
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
Unit Basin Storage Volume (inches)
24-hr Drawdown
Runoff Coefficient = 0.25
Runoff Coefficient = 0.50
Runoff Coefficient = 0.75
Runoff Coefficient = 1.00


Riverside Citrus Experiment Station (7473) - Riverside County, California
Capture / Treatment Analysis
Capture (% of Runoff)
100
90
80
70
60
50
40
30
20
10
0
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
Unit Basin Storage Volume (inches)
48-hr Drawdown
Runoff Coefficient = 0.25
Runoff Coefficient = 0.50
Runoff Coefficient = 0.75
Runoff Coefficient = 1.00